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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

In re the application of:

Alexander S. Kozlov, et al.

Serial Number: 09/611,182

Docket: H16-26603

Serial Number: 09/611,182

Group Art Unit: 1762

Filed: July 6, 2000

Examiner: M. Barr

For: ELECTROLESS PLATINUM-RHODIUM ALLOY PLATING

REPLY BRIEF FOR APPELLANT

Assistant Commissioner for Patents  
Washington, D.C. 20231

Sir:

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This is a Reply to the Examiner's Answer filed on February 6, 2002 to Appellant's Appeal Brief filed on January 9, 2002. This reply brief is hereby filed in triplicate.

Appellants hereby acknowledge the Examiner's statement regarding the minor error in the Appendix. A new Appendix is hereby submitted. The new Appendix includes claim 23 having the word "ceramic" rather than "ceramics".

Regarding paragraph 7 of the Examiner's Answer, the Examiner states that the claims will stand or fall together because the Appeal Brief lacks a statement to the contrary. It is respectfully submitted that this is incorrect. The invention presents four (4) separate groups of claims that are outlined in paragraph VII of the Appeal Brief. These claims have been intentionally separated into four groups that do not stand or fall together. Group I is directed to claims 1-10 which pertain to an

electroless plating composition of the invention. Group II is directed to claims 11-23 which pertain to a process for the electroless plating of a substrate. Group III is directed to claim 25 which also pertains to a process for the electroless plating a substrate. Group IV is directed to claim 26, which pertains to an article comprising a substrate immersed in a plating composition of the invention. More specifically, the Group I claims are not grouped with claims 11-23, or 25-26 because should the claims for the composition fall, it does not necessarily follow that the claims for the processes in Groups II or III should fall, nor should the immersed substrate of Group IV necessarily fall. Group II claims are separated because the process claims should not necessarily fall should the composition claims of group I fall or should the immersed substrate of claim 26 fall. Claim 25 is also considered separate from the Group II process claims, and all of the other claims, because it includes the additional step of removing the substrate from the plating solution. This step is not a limitation of the Group II process claims. Finally, claim 26 is considered separate from each of the other claims because it is directed to an article comprising a substrate immersed in a composition of the invention, while none of the other claims are directed to an article. It is therefore requested that the claims of Groups I-IV be reviewed by the Board separately.

Claims 1-2, 4, 7, 9-21, 23 and 25-26 stand rejected under 35 U.S.C. 103(a) over Rhoda et al. in view of Chang et al. It is submitted that this ground of rejection is incorrect and should be overruled.

The invention claims a composition and process for electroless plating of a platinum-rhodium alloy onto substrates. The claimed composition comprises an aqueous solution of a water soluble, platinum nitrite salt or platinum amine-nitrite salt; a water soluble rhodium nitrite salt or rhodium amine-nitrite salt; ammonium

hydroxide as a complexing agent; and hydrazine hydrate as a reducing agent. The claimed plating process utilizing the claimed plating composition is autocatalytic and deposits high purity platinum-rhodium alloy coatings on substrates if virtually any material and of any geometrical shape. It is also essentially free of sulfur, phosphorus, chlorine and non-volatile components that cause impure plating, allowing for improved appearance and properties of the plated alloy, generates essentially no hazardous substances and avoids the accumulation of byproducts that degrade the plating bath, allowing for virtually unlimited replenishment of the bath. The composition of the plating bath also allows metallic rhodium and platinum to be precipitated from the bath by boiling without undesirable contaminants.

Rhoda et al. disclose a bath and process for non-electrolytic deposition of platinum and platinum alloys onto a substrate. The bath disclosed may comprise an aqueous solution of an alkaline platinum IV hydroxide, hydrazine and sodium or optionally ammonium hydroxide. A rhodium salt, particularly ammonium rhodium III chloride, rhodium III nitrate, diammonium sodium rhodium III chloride or ammonium rhodium III nitrite may be added to the bath to plate a platinum-rhodium alloy onto a substrate. *Rhoda et al. do not disclose either a water soluble, platinum nitrite salt or platinum amine-nitrite salt.*

With regard to the dependent claims, the rhodium salts disclosed by Rhoda et al., are even more different than the rhodium salts disclosed by Appellants. Appellants employ rhodium salts of the formula  $M_z[Rh(NH_3)_x(NO_2)_{(6-x)}](NO_2)_y$ , wherein  $x=0$  to  $6$ ,  $y\geq 0$ ,  $z\geq 0$  and M comprises an alkali metal or  $NH_4^+$  cation, the cation preferably comprising sodium, potassium or ammonium  $NH_4^+$ . Appellants also disclose triaminetris(nitrito-N,N,N)rhodium(III), or  $Rh(NH_3)_3(NO_2)_3$ , and

diammonium sodium hexanitrorhodate (III); or  $(\text{NH}_4)_2\text{Na}[\text{Rh}(\text{NO}_2)_6]$ . The rhodium salts disclosed by Rhoda et al. are ammonium rhodium III chloride  $[(\text{NH}_4)_3\text{RhCl}_6]$  rhodium III nitrate  $[\text{Rh}(\text{NO}_3)_3]$ , diammonium sodium rhodium III chloride  $[(\text{NH}_4)_2\text{NaRhCl}_6]$  and ammonium rhodium III nitrite  $[(\text{NH}_4)_3\text{Rh}(\text{NO}_2)_6]$ .

Rhoda et al. do not disclose platinum salts within the scope of the invention, as admitted by the Examiner. The reference broadly discloses alkaline platinum IV hydroxide solutions, and only specifically discloses sodium platinum IV hydroxide  $[\text{Na}_2\text{Pt}(\text{OH})_6]$ . These compounds are not within the scope of water soluble platinum nitrite salts or platinum amine-nitrite salts as disclosed by Appellants. Specifically, Appellants employ platinum nitrite salts or platinum amine-nitrite salts having the formula  $\text{M}_z[\text{Pt}(\text{NH}_3)_x(\text{NO}_2)_{(4-x)}](\text{NO}_2)_y$  wherein  $x=0$  to 4,  $y \geq 0$ ,  $z \geq 0$  and M comprises an alkali metal or  $\text{NH}_4^+$  cation. The cation is preferably sodium, potassium or ammonium  $\text{NH}_4^+$ . The preferred platinum compound disclosed is diaminebis(nitrito-N,N)platinum (II), or  $\text{Pt}(\text{NH}_3)_2(\text{NO}_2)_2$ , sometimes referred to as diaminedinitroplatinum, or P-salt, or diamineplatinum (II) nitrite; also existing as cis- and trans-isomers, both of which may be employed. None of the platinum compounds disclosed in the reference correspond to those specifically disclosed by Appellants, nor do they fall within the above formula.

The Examiner has applied Chang et al. to show the use of platinum as a platinum nitrite or amine-nitrite salt. Chang et al. disclose an electroless plating bath for plating spark plug tips with platinum, wherein the bath comprises a solution of platinum diamine dinitrite, hydrazine hydrate and ammonium hydroxide.

The examiner maintains that the claimed composition and process would be obvious after a review of Rhoda and Chang. Particularly, the Examiner states that that it would be obvious to one of skill in the art to use the platinum salt disclosed in Chang et al. with the disclosure of Rhoda et al., with the expectation of providing the desired electroless plating results, because such a platinum salt is conventionally used in electroless plating solutions with hydrazine hydrate and ammonium hydroxide. It is again submitted that such employs an inappropriate obvious to try standard.

While Chang et al. discloses the use of a platinum diamine dinitrite, there is no teaching or suggestion in the art to combine the platinum diamine dinitrite with a rhodium salt to form an electroless plating bath. More particularly, there is no teaching or suggestion to combine their a platinum diamine dinitrite with a rhodium nitrite salt or rhodium amine-nitrite salt in solution with hydrazine hydrate and ammonium hydroxide to form a composition suitable to plate a platinum-rhodium alloy onto a substrate. Further, it is essential to recognize that not only is there nothing in the art to suggest a combination of these references to achieve the results of the claimed invention, but it is by no means conclusive that a combination of the teachings of these references would form a *compatible* solution having the stability of the presently claimed composition.

This is particularly clear with regard to the incompatible use of ammonium hydroxide in each of Rhoda and Chang. At column 5, lines 25-29 of Rhoda et al., it is specifically stated that *ammonium hydroxide may not be employed in amounts greater than about 1 gram/liter* because greater amounts of ammonia cause precipitation of platinum from solution and causes problems with plating copper substrates. In contrast, at column 4, lines 65-67 through column 5, lines 1-3, of

Chang et al., it is disclosed that their electroless platinum plating bath includes 100 mL/L of ammonium hydroxide. This amount certainly exceeds the absolute limit of 1 gram/liter established in Rhoda et al. Therefore, the applied art actually teaches away from a combination of their disclosures, rather than suggesting a combination of the two. In rebuttal, the examiner states that Rhoda and Chang merely use ammonium hydroxide as a pH adjuster whose concentration levels would be controllable by one skilled in the art. However, this is not necessarily so. It is respectfully asserted that one skilled in the art would recognize the difference in the plating baths of Rhoda and Chang would not automatically determine the compatibility of the platinum salt from Chang with the bath of Rhoda.

Particularly, the examiner states that it would have been obvious to one skilled in the art upon a reading of Rhoda and Chang that the platinum salt of Chang would be reduced by the plating bath of Rhoda to produce the desired alloy. Appellants respectfully disagree. Should one skilled in the art read each of the disclosures of Rhoda et al. and Chang et al. together, such a skilled person would recognize that the particular platinum salt employed by Chang et al. is not necessarily compatible in a plating bath of Rhoda et al., and it would certainly not be *prima facie* obvious that a combination would yield the desired electroless plating results. Again, one skilled in the art would be required to conduct experimentation to try and see if the particular platinum salt of Chang et al. would be compatible with the solution of Rhoda et al. This would place an undue burden on the person. Such an undue burden is indicative of non-obviousness.

Because one does not know, based on a reading of the Rhoda et al. reference, if their composition would be compatible with a solution having a platinum salt

disclosed by Chang et al., it cannot be said that the claimed invention is obvious. Rather, the Examiner seems to be stating that it would be obvious for one skilled in the art to *try* and see if the platinum salt of Chang et al. would work with the solution of Rhoda et al. Appellants respectfully submit that such is an incorrect standard of patentability. The appropriate test of obviousness is whether or not one skilled in the art would recognize upon a reading of the applied references that the platinum salt from Chang et al. would be appropriate for use in the solution of Rhoda et al. to plate a platinum-rhodium alloy onto a substrate. To satisfy this test, it must be shown that there is a teaching or suggestion in the art to combine the references. Such motivation or suggestion is not present in either of the references. Appellants again assert that requiring one skilled in the art to conduct experimentation to try and see if a particular platinum salt would be compatible with the solution of Rhoda et al. would place an undue burden on the person, which is indicative of non-obviousness.

The claimed plating composition is more stable than prior art solutions, generates essentially no hazardous substances and the absence of non-volatile components avoids the accumulation of byproducts that degrade the plating bath, allowing for virtually unlimited replenishment of the bath, and is essentially free of sulfur, phosphorus, chlorine and non-volatile components that cause impure plating, allowing for improved appearance and properties of the plated alloy. Moreover, the composition of the plating bath allows metallic rhodium and platinum to be precipitated from the plating bath by boiling without undesirable contaminants.

Appellants further submit that they have no obligation to provide any factual showing that the claimed platinum salt provides unexpected results over other platinum salts until and unless the examiner provides a valid *prima facie* case of

obviousness. It is submitted that such a *prima facie* case of obviousness has not been made. The examiner has only shown other, admittedly different salts and then leaps to the conclusion that the substitution would be obvious. A rejection on this basis is improper. The issue is not whether one skilled in the art could make such a substitution in light of Appellant's disclosure, but rather whether such a substitution is fairly *suggested by* the applied art. Such is absent. The prior art materials are not analogs, homologs or isomers and therefore the hypothetical substitution is unwarranted. There is simply no suggestion from the art that the Chang, et al compounds could or should be substituted into Rhoda, et al. For these reasons, it is submitted that the claimed invention is would not be obvious to one skilled in the prior art upon a reading of Rhoda et al. and Chang et al., and it is requested that the rejection be overruled.

Claim 3 stands rejected under 35 U.S.C. 103(a) over Rhoda et al. and Chang et al. and further in view of JP 58204168. It is respectfully asserted that the rejection is incorrect and should be overruled. Rhoda et al. and Chang et al. have been discussed above and the arguments are repeated here. JP 58204168 discloses an electroless plating bath of certain rhodium and rhodium alloys. The bath comprises a rhodium salt having the formula  $[Rh(NH_3)_6]X_3$ , wherein X is a halogen,  $NO_2$ , etc., a hydrazine reducer, an hydroxyl amine salt, and optionally a platinum salt. Appellants disclose a composition including a rhodium nitrite salt or rhodium ammine-nitrite salt having the formula  $M_z[Rh(NH_3)_x(NO_2)_{(6-x)}](NO_2)_y$ , wherein  $x=0$  to  $6$ ,  $y\geq 0$ ,  $z\geq 0$  and M comprises an alkali metal or  $NH_4^+$  cation. Appellants again assert that there is no motivation or suggestion in the art to combine the references to achieve the results of the claimed invention. The applied reference does not teach or suggest combining rhodium salts with a water

soluble platinum nitrite salt or platinum amine-nitrite salt to form a composition as in the present invention.

Additionally, similar to the discussion above, it is apparent that the Examiner is using an *obvious to try standard of patentability* to hypothesize that one skilled in the art would find it obvious to form an electroless plating composition of the present invention based on a reading of the applied art. Appellants disagree. Such is an incorrect standard of patentability. One may not merely assume that certain salts are conventionally known and therefore obvious substitutes into any known plating bath. There must be some teaching or suggestion in the art to combine the selected disclosures in order to make such a combination. Such a teaching or suggestion is absent in the applied references. Further, it is respectfully submitted that the Examiner is employing an incorrect legal standard for patentability. The belief that one skilled in the art *could* form the claimed plating bath does not suggest that one *should* form such a film to obtain the disclosed benefits.

Appellants again submit again that they have no obligation to show unexpected results over other platinum salts until and unless the examiner provides a valid *prima facie* case of obviousness. It is submitted that such a *prima facie* case of obviousness has not been made. The examiner has only shown other, admittedly different salts and then leaps to the conclusion that the substitution would be obvious. A rejection on this basis is improper. The issue is not whether one skilled in the art could make such a substitution in light of Appellant's disclosure, but rather whether such a substitution is fairly *suggested by* the applied art. Such is absent. The prior art materials are not analogs, homologs or isomers and

therefore the hypothetical substitution is unwarranted. It is therefore requested that the rejection be overruled.

Claim 22 stands rejected under 35 U.S.C. 103(a) over Rhoda et al. and Chang et al. as applied to Claim 11 above, and further in view of Ishihara et al. It is respectfully asserted that this ground of rejection is incorrect and should be overruled. Rhoda et al. and Chang et al. have been discussed above.

Ishihara et al. discloses a conductive film circuit formed on an insulator substrate or semiconductor substrate whereby a metal or metal alloy, including a platinum-rhodium, alloy is deposited onto the substrate by coating or sputtering and then subsequently etched. It is respectfully submitted that this reference is not applicable to the present invention in that it does not relate to electroless plating of a substrate. The reference does not teach or suggest that semiconductor substrates are suitable for electroless plating techniques, nor electroless plating techniques as described by the present invention. Absent such a teaching or suggestion, the claim cannot be obvious in view of the applied references. The examiner states that Ishihara is being applied solely to show the conventionality of applying a platinum-rhodium alloy plating over a semiconductor substrate. However, such a conclusion necessarily utilizes improper hindsight reasoning in forming the rejection. The examiner states that *any* judgment of obviousness must be done with a hindsight reconstruction provided it takes into account the level of ordinary skill in the art. This is not the standard of patentability. There must be an affirmative suggestion from the art that the hypothetical reconstruction be made. An examiner cannot merely recognize the differences between the art and the claims and then leap to the conclusion that the differences could easily be foreseen by one skilled in the art. An examiner's opinion is not prior art *per se*.

Further in view of the differences between the claimed invention and the applied art discussed above, it is asserted that this reference is irrelevant to the patentability of the invention. For these reasons it is requested that the rejection be overruled.

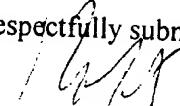
Appellants have called upon the examiner to provide a declaration under 37 CFR 1.104(a) concerning *facts* within his own knowledge concerning the level of ordinary skill in the art upon which he relies and exact how the conclusion is drawn that the differences between the claims and the applied prior art would be easily recognized by one of ordinary skill in the art. The examiner has refused to provide such a declaration. It is therefore requested that the Board regard the examiner's assertions only as the examiner's personal opinions and not as persuasive authority concerning the state of the art.

No matter how one applies or combines these references they do not teach the composition of the electroless plating bath of the claimed invention to attained the demonstrated benefits. It is submitted that the Examiner is reconstructing the art in light of Appellants' disclosure. Where Appellants' teachings are needed to find the invention, the invention is not obvious. Appellants acknowledge the Examiner's statement that a judgment on obviousness must only depend on knowledge which was within the level of ordinary skill at the time of invention, and not depend on knowledge gleaned only from Appellants' disclosure. However, Appellants respectfully submit that one skilled in the art would not have the necessary knowledge to find the present invention obvious without first reading Appellants' disclosure, and that the Examiner has not made a determination of obviousness which is detached from knowledge of the presently claimed invention. Appellants respectfully submit that there is no suggestion

from any reference that one should combine the references in order to achieve the inventive composition having the described benefits. Moreover, when selective combination of prior art references is needed to make an invention seem obvious, there must be something in the art to suggest that particular combination other than hindsight gleaned from the invention itself, something to suggest the desirability of the combination. Uniroyal, Inc. v. Rudkin-Wiley Corp., 5 USPQ2d 1434, 1438 (CAFC 1988). Such a suggestion is absent in the cited references.

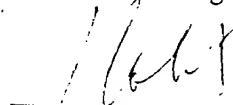
None of the cited references, taken alone or in combination, teaches or suggests the invention claimed by Appellants. For these reasons, and in light of the arguments above regarding Rhoda et al. and Chang et al., claims 1-23, 25 and 26 are urged to be patentable over the cited references, and the rejections under 35 U.S.C.103 should be overruled.

Respectfully submitted,



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IX. APPENDIX

1. An electroless plating composition comprising an aqueous solution comprising:
  - a) a water soluble, platinum nitrite salt or platinum ammine-nitrite salt;
  - b) a water soluble rhodium nitrite salt or rhodium ammine-nitrite salt;
  - c) ammonium hydroxide; and
  - d) hydrazine hydrate.
2. The composition of claim 1 wherein the water soluble, platinum nitrite salt or platinum ammine-nitrite salt has the formula  $M_z[Pt(NH_3)_x(NO_2)_{(4-x)}](NO_2)_y$ , wherein  $x=0$  to  $4$ ,  $y\geq 0$ ,  $z\geq 0$  and  $M$  comprises an alkali metal or  $NH_4^+$  cation.
3. The composition of claim 1 wherein the water soluble, rhodium nitrite salt or rhodium ammine-nitrite salt has the formula  $M_z[Rh(NH_3)_x(NO_2)_{(6-x)}](NO_2)_y$ , wherein  $x=0$  to  $6$ ,  $y\geq 0$ ,  $z\geq 0$  and  $M$  comprises an alkali metal or  $NH_4^+$  cation.
4. The composition of claim 1 wherein the platinum compound comprises diamminebis(nitrito-N,N)platinum (II).
5. The composition of claim 1 wherein the rhodium compound comprises triamminetris(nitrito-N,N,N)rhodium(III).
6. The composition of claim 1 wherein the platinum compound comprises diamminebis(nitrito-N,N)platinum (II) and wherein the rhodium compound comprises triamminetris(nitrito-N,N,N)rhodium(III).

7. The composition of claim 4 wherein the diamminebis(nitrito-N,N) platinum (II) is present in an amount ranging from about 0.01 to about 450 g/L.
8. The composition of claim 5 wherein the triamminetris(nitrito-N,N,N)rhodium(III) is present in an amount ranging from about 0.01 to about 320 g/L.
9. The composition of claim 1 wherein ammonium hydroxide is present in an amount ranging from about 1 to about 1000 mL/L.
10. The composition of claim 1 wherein hydrazine hydrate is present in an amount ranging from about 0.01 to about 240 g/L.
11. A process for plating a substrate comprising:
  - A) providing a plating composition comprising an aqueous solution comprising:
    - a) a water soluble, platinum nitrite salt or platinum ammine-nitrite salt;
    - b) a water soluble rhodium nitrite salt or rhodium ammine-nitrite salt;
    - c) ammonium hydroxide; and
    - d) hydrazine hydrate; and
  - B) contacting a substrate with the plating composition for a sufficient time and under conditions sufficient to plate a metallic platinum-rhodium alloy onto the substrate.
12. The process of claim 11 wherein the composition is autocatalytic.
13. The process of claim 11 wherein the substrate is uniformly plated with a metallic platinum-rhodium alloy.

14. The process of claim 11 wherein the temperature of the composition ranges from about 20°C to about 98°C.
15. The process of claim 11 wherein the platinum compound is present in an amount ranging from about 0.01 to about 450 g/L.
16. The process of claim 11 wherein the rhodium compound is present in an amount ranging from about 0.01 to about 320 g/L.
17. The process of claim 11 wherein ammonium hydroxide is present in an amount ranging from about 1 to about 1000 mL/L.
18. The process of claim 11 wherein hydrazine hydrate is present in an amount ranging from about 0.01 to about 240 g/L.
19. The process of claim 11 which is conducted without electrolysis.
20. The process of claim 11 wherein the substrate comprises a metal.
21. The process of claim 11 wherein the substrate comprises a non-metal.
22. The process of claim 11 wherein the substrate comprises a semiconductor.
23. The process of claim 11 wherein the substrate comprises a ceramic.
25. A process for plating a substrate comprising:

- A) providing a plating composition comprising an aqueous solution comprising:
  - a) a water soluble, platinum nitrite salt or platinum ammine-nitrite salt;
  - b) a water soluble rhodium nitrite salt or rhodium ammine-nitrite salt;
  - c) ammonium hydroxide; and
  - d) hydrazine hydrate; and
- B) immersing a substrate into the plating composition for a sufficient time and under conditions sufficient to plate a metallic platinum-rhodium alloy onto the substrate; and
- C) removing the substrate from the plating composition.

26. An article comprising a substrate immersed in a composition comprising an aqueous solution comprising:

- a) a water soluble, platinum nitrite salt or platinum ammine-nitrite salt;
- b) a water soluble rhodium nitrite salt or rhodium ammine-nitrite salt;
- c) ammonium hydroxide; and
- d) hydrazine hydrate.